

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

Commenter/Agency	Page Number	Comment Numbers
Dr. Daniel Anderson University of California, Davis	2-9	1-16
Dr. James R. Hunt University of California, Berkeley	9-18	17-30
Dr. Erik Christensen University of Wisconsin, Milwaukee	19-25	31-43

**Attachment C3 - Response to Peer Review Comments
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**Daniel Anderson, University of California, Davis
Via E-mail dated January 3, 2007**

Comment #1

Given the diverse and distinguished representation in the original preparation and analyses in this report, along with a diverse and competent group of advisors who met at least three times to discuss various sections of this report in 2006, such a document is highly-likely to be current, scientifically sound, and representative of the most recent risk-assessment approaches to judge, for example, "how much this system can or should be allowed to 'take' from compounds X." The approach combines physical/chemical characteristics with biological characteristics (ex. BCFs) of the various compounds, and then attempts to tie them together with currently-accepted, recently-developed models (in this case as most recently developed by EPA, the TMDL).

Response #1

Comment noted. Regional Board staff carefully considered several alternatives to these TMDLs, including the use of alternative targets, but elected to use the methods and targets that met the requirements of the 2004 Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) and was consistent with EPA's approach in their technical TMDLs for toxic pollutants for the San Diego Creek/Newport Bay watershed (June 2002).

Comment #2

Given the fairly large (actually huge) body of toxicological and physiological and physical data on which to develop these models for San Diego Creek and Newport Bay, a reasonable, scientifically-based regulatory value should be possible, given the fact that it can and will be updated with new insights from the rather large research and remediation programs associated with future and current applications and research in this specific watershed. And given that this is a fairly well-studied watershed (in comparison to many others in California, but not as well-studied perhaps, for example, as San Francisco Bay), I would still expect reasonable and useful TMDL values, especially given the many outstanding follow-up studies that are listed in the report. I wonder if some kind of comparative data (a paragraph or two) on TMDLs from other systems in California would be useful.

Response #2

There are few other TMDLs for organochlorine compounds that have been adopted in California that provide a direct comparison with the Newport Bay TMDLs. The Los Angeles Regional Board recently adopted "TMDLs for Organochlorine Pesticides, Polychlorinated Biphenyls, and Siltation in Calleguas Creek, its Tributaries, and Mugu Lagoon." While there are some similarities between the San Diego Creek/Newport Bay and Calleguas Creek/Mugu Lagoon systems (mostly in that sediment is the major contributing source of the organochlorine pollutants), they are hydrologically very different. Regional Board staff did review the Calleguas Creek/Mugu Lagoon TMDLs, but elected to adhere as closely as possible to the technical TMDLs for Toxics for the San Diego Creek/ Newport Bay watershed promulgated by EPA in June 2002.

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

Comment #3

Given that these TMDLs reviewed here are for "legacy" organochlorines, it is important that the sources be identified as best as possible, but this is difficult, not because of lack of scientific data but because of "legacy regulatory missions" from the past. I hope that research associated with these TMDLs will be able to "zero-in" a bit better, now that we have more modern regulatory bases and better science to assign regulatory values to ecological phenomena. I assume that the regulatory program has in it this better data-base on which to operate for currently-used and more easily source-identifiable compounds which are no-doubt being introduced into the current system. This is mentioned in your report and I assume the TMDLs for things like Se, etc. will be (are being) developed. I would expect TMDLs for these to be even more supportable through more complete data.

Response #3

TMDLs for other toxic constituents that have been identified, such as selenium and metals, are under development. The California Department of Pesticide Regulation tracks the registration and application of modern pesticides such as pyrethroids and carbamates by professional pesticide applicators. In addition, several programs and research projects are tracking the local use and distribution of pesticides in the watershed (UC Riverside Cooperative Extension, Orange County Farm Bureau, Southern California Coastal Watershed Research Project, etc.). The OCs TMDLs implementation tasks include monitoring and assessment of sediment toxicity in the watershed, including monitoring and assessment of emerging contaminants such as pyrethroids and polybrominated diphenyl ether (PBDE).

Comment #4

It wasn't immediately apparent to me as a reader of the report (but I didn't study it real carefully), but I assume that some of the current studies will be doing PCB-isomer specific, dioxin, co-planar PCBs, etc. analyses in a representative high trophic-level indicator species in the system (preferably in the lower reaches of the system, where maximum bioaccumulation would be expected to occur).

Response #4

SCCWRP is currently conducting a study that is assessing the transfer of organochlorine compounds and trace metals in the fish food web in Newport Bay. California halibut, a high trophic level species in the Bay, are being collected in addition to a variety of fish species from lower trophic levels. All samples, including fish food items, will be analyzed for PCB congeners. For comparison to predator-risk guidelines for PCBs, PCB congener concentrations will be converted to Toxicity Equivalent Quotients (relative to dioxin TCDD). The relative toxicity of PCB congeners will be calculated separately for bird and mammal predators of the fish species sampled.

Comment #5

Some of the more sensitive and sophisticated chemical analyses and determinations should be possible from tissue analyses through the (probably already completed) SCCWRP studies which should be reporting to you at the end of this coming March. I don't know which bird species SCCWRP is studying, but (perhaps too late here but still possible

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

for a future study) a common species in the system rather than, say, endangered or listed species should be used as a continually monitored indicator or sentinel species. In these cases, dynamics, etc. of various compounds are essentially the same in species less likely to be affected and therefore more amenable to detailed study, with more data and samples possible, than the species experiencing potential problems, listed, etc. In that regard, I found the limited data on clapper rails to be minimally (or not even) useful for determinations related to the TMDLs in this report. Use of more common bird species, for example, a bit "lower on the food-web" would seem to be instructive. Pharmacodynamics and effects in these species still operate pretty much on a dose/response basis and are highly predictable (for example, the "gull models" developed by the CWS). Isotope studies can also better place your upper-trophic species (fish or fowl) into a more quantifiable trophic position. Basing regulatory values on only listed-species again moves you from an ecological, scientific basis to a more policy basis. Don't just consider the listed species in the system. They will yield you the lesser amount of useful regulatory data. Of course, don't ignore them completely either.

Response #5

SCCWRP and CH2M Hill are nearing completion of a multi-species bird egg study for the watershed that includes birds from a variety of trophic levels and habitats including invertivores (stilts and avocets), herbivores (American coot), omnivores (Pied-billed grebe) and piscivores (Forester's terns, black skimmers). Isotope studies being performed by SCCWRP, as part of their assessment of the food web transfer of organochlorine compounds and metals in fish in Newport Bay, will help in assessing the trophic levels of predators in the bay ecosystem that may be at risk from these compounds. Part of the purpose of the multi-species bird egg study is to help determine appropriate sentinel species for the contaminants of concern (primarily DDE and selenium).

Comment #6

Could you include a short discussion on why the EPA TMDLs of 2002 were basically redone by the Santa Ana WQCB? What were the differences, briefly, in approach and methodology? Is this a routine or sensitive subject? Just knowing the current situation, I would guess that the state's approach is more conservative and perhaps more complete and scientific. I just wondered about this as I read through the report.

Response #6

There are several reasons why EPA's technical TMDLs were revised by Regional Board staff: (1) The State Listing Policy was adopted after EPA's development of the technical TMDLs but prior to development of the Regional Board's OCs TMDLs Basin Plan Amendment (see sections 2.3.1 and 2.4.3 of the November 17, 2006 OCs TMDLs technical report), which required revision of the impairment assessment using the State Listing Policy's recommended methodologies. These differed from the methodology used by EPA to establish the technical TMDLs; (2) Regional Board staff corrected some minor errors in EPA's load calculations and also used more recent fish tissue data to calculate existing loads (section 4.3); (4) EPA did not consider the established sediment TMDLs for Newport Bay and the San Diego Creek watershed in their calculations so Regional Board staff recalculated the loading capacity based on the sediment TMDLs target of 62,500 tons per year for Newport Bay (section 5.2); and (5) EPA is not required to develop an

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

implementation plan as it is the Regional Board's responsibility to do that; therefore, Regional Board staff developed an implementation plan to complete the TMDLs (section 8 of the November 17, 2006 OCs TMDLs technical report).

Comment #7

On Table 2-2, I wondered why PCBs and PCB-like compounds were not interpreted through the TEQ [Toxicity Equivalent Quotient] approach. Would at least this not warrant some further study with very sophisticated analytical chemistry (say, in a representative series of samples or some representative pools?). I know it is expensive. I see that in Table 2-5, the TEQs for birds and mammals are mentioned. Realizing that the clapper rail samples were the only wildlife values represented, there would be no other data to evaluate for TEQs unless a high trophic, resident fish (page 20) could be evaluated on this basis. What am I missing here? I just have to accept the other values in the same table.

Response #7

Table 2-2 (page 12 of the November 17, 2006 OCs TMDLs technical report) lists the ambient water quality criteria for organochlorine compounds from the California Toxics Rule (CTR). The CTR did not use the TEQ approach for PCBs. The CTR ambient water quality criteria for PCBs is based on the sum of seven Aroclors (1242, 1254, 1221, 1232, 1248, 1260, and 1016) and the human health criterion was derived using a cancer potency factor of 2 per mg/kg-day, and upper bound potency factor reflecting high risk and persistence. This approach was based on multimedia studies that indicated that the major pathway of exposure to persistent toxic substances was through diet, primarily consumption of contaminated fish and shellfish (CTR section F.3d). The TEF (Toxicity Equivalency Factor) approach was only used to develop the dioxin (2,3,7,8-TCDD) criteria (CTR section F.3a). Table 2-5 (page 19 of the November 17, 2006 OCs TMDLs technical report) references TEQs (Toxicity Equivalent Quotients) for mammal and avian diet, as these are the water quality guidelines recommended by the Canadian government for the protection of aquatic life. The State Listing Policy recommends the use of the OEHHA screening values for human health assessment and NAS guidelines for protection of aquatic life in impairment assessments; therefore, the Canadian guidelines were not used. At this time, there are not sufficient data available to use TEQs, though studies currently in progress will ultimately provide this information (see Response #4). Additionally, as part of the revised TMDL implementation plan, an Independent Advisory Panel (IAP) will be established during implementation to help guide special studies and implementation actions. The IAP can evaluate the PCBs data collected to date and assess whether further study of this issue is warranted.

Comment #8

On page 24, when "adverse effects were caused by DDT or its metabolites", does this mean the different forms are analyzed and interpreted separately. With DDE, some agencies (I think EPA and some state agencies I have talked-to) have developed eggshell thinning indices as an easily-measurable endpoint for DDE effects, because shell thinning has been so well and extensively studied. This would be quite easy to do with some kind of indicator species (page 26), such as one of the ardeids in the Newport Bay (upper?) system. I just do not know which species nest there, but would guess there is a colony of DCCO [Double-crested cormorant] or ardeids (such as BCNH [Black-crowned night heron])

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

or GBHE [Great blue heron], that could be sampled, perhaps a tern other than LETE [Least tern]) that could be studied (and sampled).

Response #8

See Response #5. Bird eggs were analyzed for Total DDTs, 2,4-DDE, 4,4-DDE (*p,p'*-DDE), 2,4-DDD, 4,4-DDD, 2,4-DDT, 4,4-DDT. As expected, mostly *p,p'*-DDE was detected in the eggs. Eggshell thicknesses were also measured and compared to *p,p'*-DDE concentrations. Measurements of avocet and stilt eggshells collected from the San Diego Creek watershed as part of the SCCWRP multi-species bird egg study showed some thinning compared to reference eggs collected from Nevada in 1991 (Robinson and Oring 1996, 1997) that appears to correlate with *p,p'*-DDE levels. This would appear to support the limited clapper rail data collected in the earlier study and referenced in the TMDLs.

The freshwater areas in the watershed are highly urbanized with nesting locations generally limited to the marshes and in-line sedimentation basins and riparian areas at the downstream end of San Diego Creek. Nests from clapper rails, Forester's terns, Least terns, Black skimmers, avocets and stilts were found in and around Upper Newport Bay. Though Double-crested cormorants, Black-crowned night herons and Great blue herons are present in the watershed, no nests or eggs were found during the study. However, eggs from Pied-billed grebes, Black skimmers and Forester's terns were collected and analyzed for organochlorine pesticides, PCBs, selenium and metals.

Comment #9

The current field data demonstrate very convincingly that OC residues have and are declining in the system and that levels have become very low, and expectations are that TMDLs will continue to show this (perhaps accelerated by remediation). I wouldn't expect direct toxic effects any more (even eggshell thinning) but perhaps some endocrine disruptions and perhaps biomarker effects that would be physiologically demonstrable but perhaps might not be ecologically relevant, i.e., such minor effects might logically be compensated-for in the biota. Don't know if this is worthy of discussion, however, as it just brings up more unknowns.

Response #9

Trend monitoring will continue during implementation. Additional special studies are also planned during the implementation phase of these TMDLs to determine impacts to fish and wildlife in the watershed. These studies may include assessment of indirect toxic effects such as nest productivity, or number of fledged young/nest, in addition to eggshell thinning and hatching success. The natural attenuation of these compounds is recognized and the implementation plan is structured to enhance or supplement that process. Future investigation may demonstrate that TMDLs for one or more of the organochlorine compounds are no longer necessary; in that case, the TMDLs could be removed through an appropriate 303(d) delisting process.

Comment #10

Regarding the use of sediment residues, sampling them is good because of the known relationships between sediment samples and organisms that seem in most cases better than water samples, but I also wonder if the sediments aren't "sequestering" some of the

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

contaminants in some instances. It would seem that this is an interesting question to pursue and it might relate to declining residues in the biota so adequately demonstrated in this report. I think that "story" is worth a publication, by the way.

Response #10

Staff are aware of the declining trends in sediment residues, though in most cases those trends are not nearly as well defined as in the earlier (pre-1990s) data. During implementation, these trends will continue to be monitored and special studies are planned to assess the relative contributions of sediments coming from the upper portions of the watershed compared to the re-suspension and redistribution of contaminated sediments within Newport Bay.

Comment #11

In the bay, exceedences seem clear enough, as speculated, through bioaccumulation, but it is not clear if they are local in some cases. San Diego Creek and the drainages of the Tustin Plain seem clearly impeded, and the most conservative ("safest") approach seems to develop TMDLs for anything that exceeds or might be expected to exceed safe levels. The development of informational TMDLs is also a good idea. The more information, the better.

Response #11

Commented noted. Additional studies being conducted by SCCWRP should determine whether bioaccumulation is occurring throughout the Bay, or only at specific locations (hot spots) or within certain types of food webs.

Comment #12

I wonder about looking at PBDEs. Perhaps it is already being done.

Response #12

Regional Board staff has initiated a tissue and trend monitoring program for the watershed that includes the collection of sediment, fish tissue and water column samples and the deployment and collection of mussels for bioaccumulation. The samples are being analyzed for the current TMDL constituents (selenium, metals, organochlorine compounds) as well as polybrominated diphenyl ethers (PBDEs) and pyrethroids. The sampling and analyses are being performed by the California Department of Fish and Game (DFG) and are following the methods established for the Toxic Substances Monitoring Program (TSMP) and State Mussel Watch Program (SMW) under the Surface Water Ambient Monitoring Program (SWAMP) protocols.

Comment #13

I would say the most important work regarding sensitive wildlife work (birds, amphibians?, reptiles?) is not done. Will the SCCWRP study help out on this question?

Response #13

SCCWRP is currently conducting two studies, and the DFG is also conducting a monitoring program, which will significantly add to our knowledge of the effects of organochlorine compounds in fish and wildlife. The multi-species bird egg study collected bird eggs from a

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

variety of species including invertivores, herbivores, omnivores and piscivores, fresh and saltwater fish, tadpoles (African clawed frog), turtle eggs (red-eared sliders), and bird food items such as plants and invertebrates. SCCWRP is also conducting a study that is assessing the food web transfer of organochlorine compounds and trace metals in fish in Newport Bay. DFG is conducting trend monitoring in the watershed that includes the sampling and analysis of fish and mussel tissue, sediment and water for metals, selenium, organochlorine compounds, PDBEs, and pyrethroids.

Comment #14

A minor typo? Page 44, first sentence after "DDT." If you have information that DDT use began in the 1930s, I would be astonished; as its insecticidal properties were only discovered in 1939 and it was a military secret throughout World War II. I'll bet you mean the 1940s (after the war was over).

Response #14

You are correct; it was a typographic error and will be listed under the errata in the supplemental staff report.

Comment #15

On page 46, end of second paragraph, several statements seem a bit unclear. First "brown pelican seems to be the most susceptible to adverse biological effects." I don't think this is true. For example, DCCO [Double-crested cormorant] may be more susceptible or at least equally susceptible. The brown pelican is the most-studied, and therefore the most well-known to have been affected by these legacy pollutants. BRPE [Brown pelican] is now being reviewed by CA and USFWS for de-listing because of its recovery from DDE. Brown pelicans barely use the study area (the coastal parts) and do not breed there (but fairly close). And the statement of a threshold of 3 ppm ww for eggshell thinning in the BRPE, I am sure comes from studies in the east by Blus and colleagues. The reference given is EPA 2000, but there are two (unlikely) references given, 2000a and 2000b. Given this is not even a major part of the TMDL evaluation, one wonders why it is even (a bit carelessly) mentioned. I do know this literature very well, and it gives me a little "pause" regarding citations I am much less familiar-with. Just a word of caution here not to appear careless! I am on your side.

Response #15

The correct reference is from USEPA 2000b, "Appendix to Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment. Status and Needs. Chemical-Specific Summary Tables. EPA 823-R-00-002." The statement on page 328 of that report is as follows "Studies have shown the brown pelican to be most susceptible to adverse effects, with eggshell thinning and depressed productivity occurring at 3.0 µg/g of DDE in the egg and reproductive failure when residues exceed 3.7 µg/g [13]." Blus is indeed listed as the reference: "Blus, I.J., 1996. DDT, DDD, and DDE in birds. In *Environmental contaminants in wildlife*, ed. W.N. Beyer, G.H. Heinz, and A.W. Redmon-Norwood, pp. 49-71. Lewis Publishers, Boca Raton, FL." The inclusion of this information in the referenced paragraph in the November 17, 2006 staff report was to summarize the known adverse biological effects of DDT and its isomers to plants and wildlife using a variety of sources and references. While Blus was the original source for this information,

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

the statement in the staff report was taken directly from the EPA document referenced. According to Dr. Harry Ohlendorf (electronic mail dated February 2, 2007; Attachment E) cormorants are not among the most sensitive species to the effects of DDE, though their eggshell quality and reproductive success has been affected.

Comment #16

However and overall, this is an impressive document, I think well supported by the science of ecotoxicology, the data, and the data analysis; and then, to even be further documented with the impressive follow-up studies now underway and soon to be in your hands. I have no serious problems with the report, and it promises to get even better with more science coming-in.

Response #16

Comment acknowledged. Regional Board staff are hopeful that the special studies currently underway, and those recommended as part of the Phase 1 implementation portion of these TMDLs, will resolve many of the questions regarding the sources and impacts of the organochlorine compounds in the San Diego Creek/ Newport Bay watershed.

***Dr. James R. Hunt, University of California, Berkeley
Comment letter date April 30, 2007***

Comment #17

Arriving at Total Maximum Daily Loads within evolving watersheds is a complex task that requires considerable judgment and integration across a wide range of scientific disciplines. What is immediately apparent for this proposed action is that the environmental regulatory framework adopted in the United States over the last 40 years is having an effect. California and the United States have recognized that DDT, PCBs, Chlordane, and Toxaphene were environmentally persistent and toxic to the environment. Their removal from production and use has resulted in declining concentrations in biota, but the time required for improvements are unfortunately measured in tens of years. Given the presence of these compounds and mixtures in the San Diego Creek/Newport Bay watershed at levels anticipated to cause impairment, watershed planning is needed to guide further improvements.

Response #17

As part of the revised implementation plan for these phased TMDLs, the opportunity is provided to utilize a holistic watershed approach to design and prioritize monitoring, source assessment, potential impacts and remediation of organochlorine compounds and other potential sources of toxicity such as selenium, metals and emerging contaminants like PBDEs and pyrethroids. This approach would be through the development of a work plan by a working group of stakeholders (which includes local agencies, developers and environmental groups) to prioritize and synchronize special studies, monitoring, source analysis and remediation (primarily through source controls and iterative best management practice [BMP] implementation). In addition, an Independent Advisory Panel (IAP) will be

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

established to help address/resolve areas of uncertainty and to direct and advise on work plan tasks.

Comment #18

The basin plan amendment wisely recognizes the critical importance of sediments in the partitioning of these organochlorine compounds and in determining the fate of these compounds within the watershed. The very high hydrophobicity of these compounds as quantified by the octanol water partition coefficient, K_{ow} , predicts that the concentrations dissolved in water will be very small and difficult to measure. Models are therefore needed to address partitioning and bioavailability.

Response #18

The State of California is in the process of developing sediment quality objectives (SQOs) for enclosed bays and estuaries. These are expected to be narrative objectives with guidance on deriving protective sediment concentrations. As part of this effort, San Francisco Bay and Newport Bay are being used to develop an empirical and mechanistic food web model to calculate protective sediment concentrations for legacy pesticides and PCBs. The SQOs are expected to be completed and adopted by 2009 and these may be used to revise the proposed OCs TMDLs sediment numeric targets, and the TMDLs themselves.

Comment #19

Given the importance of compound sorption to sediments, sediment control in the uplands portion of the watershed is needed to minimize sediment erosion and deposition in sensitive downstream habitats. There are also concerns with the release of the sediments through erosion during extreme hydrologic events and eventual deposition within the creek channels, Newport Bay, and perhaps in the coastal waters.

Response #19

Comment noted. Extensive efforts have been and continue to be made in the watershed to address erosion and siltation problems. Sediment TMDLs for Newport Bay and the San Diego Creek watershed have been established and are being implemented. These TMDLs are being reviewed and may be revised. The implementation plan for these TMDLs includes measures to control and reduce sediment loads from upland areas in urban storm water flows and construction runoff and from nurseries and agriculture through the revision of permits, evaluation of appropriate BMPs, and monitoring (see Sections 8.3.1, 8.3.2 and 8.3.4 of the staff report).

Comment #20

On page 37, the [Basin] Plan Amendment states that because of the large number of assumptions required to apply Equilibrium Partitioning, a different approach was followed to arrive at numeric targets. Concepts of equilibrium partitioning appear throughout the Plan Amendments with some unanticipated consequences. It thus appears odd to say that equilibrium partition has not been applied.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Response #20

This particular statement on page 37 (of the November 17, 2006 OCs TMDLs technical report) refers only to the fact that the *sediment numeric targets* were not specifically calculated for the Newport Bay watershed using the equilibrium partitioning method and local data. It is not meant to refer to equilibrium partitioning with regards to the TMDLs as a whole.

After consultation with USEPA staff, it was determined that sufficient site-specific data were not available to generate reliable numeric targets for sediments in the Newport Bay watershed using the equilibrium partitioning method. Small differences in the octanol-water partitioning coefficient ($\log K_{ow}$) and total organic carbon (TOC) could result in large differences in the numeric targets. Therefore instead, staff elected to use effects-based guidelines for the majority of the sediment numeric targets, as did USEPA in their 2002 Toxics TMDLs for the San Diego Creek/Newport Bay watershed. However, as a result of the complex composition of toxaphene (it is a mixture of about 670 different chlorinated compounds), effects-based guidelines for toxaphene were not available. Therefore, the lowest, most conservative value derived using the equilibrium partitioning method – in this case, the State of New York's equilibrium partitioning-derived target for toxaphene – was selected for the numeric sediment target for toxaphene.

Comment #21

On page 45, Table 4-1 utilizes equilibrium partitioning to relate organochlorine partition coefficients to octanol water partition coefficients. First, in footnote (a) the relationship has an error and should probably be written as $\log K_{oc} = 0.00028.0 + 0.983 \log K_{ow}$ and the contribution of the term 0.00028 is minimal and could be dropped. The ratio of Bioconcentration Factor to the octanol water partition coefficient, BCF/K_{ow} , should be a measure of the lipid fraction in the organism assuming equilibrium partitioning. In calculating that ratio for the organochlorine compounds in Table 4.1, the values range from 0.018 for Chlordane to 0.16 for Toxaphene, which suggests data from difference sources and for different organisms are being combined (footnote (k)). For consistency, the same reference organism should be used. The bioconcentration factor from Table 4-1 is critical in the subsequent analysis.

Response #21

The error noted in the equation will be corrected in the supplemental staff report. The selected BCF values were organism specific. We used the same BCF values and K_{ows} used by EPA in their technical TMDLs for Newport Bay. In general, EPA used their Water Quality Criteria documents, which provide organism-/species-specific values, to select the BCF values. Where appropriate, they used BCF values for Fathead minnows as the most common tested biological species. For DDT, EPA selected a BCF value for common shiner (*Notropis cornutus*). For K_{ow} values, they reviewed and carefully scrutinized the scientific literature to select the appropriate values for each organochlorine chemical. EPA recognized that there is considerable debate regarding the appropriate chemical specific K_{ow} values, and after public input, they selected K_{ow} values that were consistent with the "slow-stirring" approach cited in de Bruijn et al. (1989) and supported in the U.S. Geological Survey (USGS) review (2001).

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Comment #22

The model for calculating existing loads appears in equation (5) on page 62. This model appears simple but has within it many assumptions that might be in conflict. A measured tissue concentration (TC) divided by a literature value of the bioconcentration factor is an estimate of the equilibrium organochlorine concentration dissolved in water. The total suspended concentration is then obtained by dividing by the fraction that is dissolved and this comes from an equilibrium sorption model appearing in equations (9) and (10). Hydrologic variability is then incorporated by picking three different flow tiers and summing up the contributions, although the summation sign is missing from equation (5). As is demonstrated in Figures 2-6 through 2-8, there are substantial differences in tissue concentrations in winter and summer, suggesting either fish migration or rapid exchange of these organochlorine compounds between these organisms and the environment. It is my understanding that compounds with octanol water partition coefficients in the range of these organochlorine compounds are not readily purged from organisms over the seasonal time scale. This appears to be a case where an equilibrium partitioning model is being adopted continuously over the seasons when the system is not at equilibrium. Bioconcentration factors appear in Table 4-1 and are used in Table 4-7 for this estimate of loading, but those numbers were variable due to different organisms. This is inconsistent with the intent of arriving at an annual loading. The model needs greater development, justification and description.

Response #22

Existing loads in San Diego Creek were estimated using the same process as was used by USEPA (2002). That procedure utilized the geometric mean of recently-measured tissue concentrations in *Cyprinella lutrensis* (red shiner) collected in 1998 during monitoring conducted for the TSMP (USEPA 2002), and the bioconcentration factors (BCFs) obtained from scientific literature. In the revised TMDLs proposed by Regional Board staff, recently-measured fish tissue concentrations were used to best represent current conditions. The geometric mean of red shiner and fathead minnow tissue concentrations from TSMP samples collected in 2002 (the most recent data available at the time the staff report was being prepared) were used in calculations of existing loads along with BCFs derived from the literature for fathead minnows and common shiners, a close relative of red shiners. Note that our calculations resulted in lower existing loads than what EPA had calculated in their TMDLs. This is likely a result of the continuing decline of these compounds in fish and sediment in the watershed.

The differences in fish tissue concentrations in winter verses summer samples is not a statistically-supported trend for DDT. Some resident fish species, such as arrow goby and California killifish, actually show opposing trends. For example, the DDT concentrations measured in the five arrow goby composites collected by SCCWRP in 2000-2002 show higher concentrations in the summer samples compared to the winter samples; however, the opposite is seen in the California killifish. The reason for the apparent seasonal variability in fish tissue concentrations for other contaminants is not known, but may be a result of a variety of confounding factors and not truly a seasonal trend for the following reasons: many of the fish sampled were juveniles, so their tissue concentrations would only represent recent accumulations of contaminants; populations and number of fish species differ dramatically from summer to winter; different sampling methods were used at

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

different times during the two-year study; and a greater variety and abundance of food sources are available in summer. Longer term monitoring of fish tissue concentrations is needed in order to determine if a true seasonal component to the contaminant trends exists.

While it is acknowledged that the San Diego Creek/Newport Bay watershed is not at equilibrium seasonally (similar to any other natural system of this type), the loads were calculated using the best and most recent data available with a clear understanding of the assumptions being made and their limitations. Regional Board staff did not have direct measurements of loads and had to use an indirect approach to generate an estimate of organochlorine compounds loads. The organochlorine compounds TMDLs are phased TMDLs and, as more site-specific data are collected, the load estimates and load models will continue to be refined and updated.

Comment #23

The sediment transport modeling greatly benefited from earlier work that utilized the 22 years of US Geological Survey records available on the San Diego Creek. While it is computationally convenient to utilize three flow tiers (low, medium and high) and pick the mean values for those flows, there is no documentation that this analysis preserves sediment loading. Since sediment transport via equation (11) is nearly proportional to flow rate squared, extremely high flow events completely dominate in terms of sediment contribution. Since the actual data are available, how does this three tier model compare to the annual sediment loss calculated from measured daily data?

Response #23

Equation 11 was used to calculate the loading capacity for Upper and Lower Newport Bay, but not for San Diego Creek. The loading capacity in San Diego Creek was based on the allowed annual Sediment TMDL load of 62,500 tons per year and is not related to the regression equation between flow and sediment load (equation 11) or the flow tiers. At this time, there is no way to directly measure loads and plot them against hydrologic variability during high flow events in the creeks, so the existing loads in San Diego Creek were back-calculated from fish tissue concentrations that were then applied to the three flow tiers.

While the flow tiers may under-predict sediment flows associated with very high flow events (e.g., El Nino 1997/1998 water year, which yielded approximately 618,000 tons of sediment), they also may over-predict sediment loads in the drier years (e.g. 2001-2002 water year, which yielded only 5,600 tons of sediment). The ten-year annual average sediment load for San Diego Creek is currently 116,248 tons (see Response #25). Though sediment loads may differ substantially from year to year, when taken as an average over a 10-year period (as is done in the Sediment TMDLs), the flow tiers are reasonably predictive of the measured long-term average sediment loads in the watershed.

For the annual reporting required by the Sediment TMDLs, the annual sediment loads for San Diego Creek and its tributaries are determined by the County of Orange by summing loads from sampled storms and using a regression equation (equation 11) between mean daily flow and mean sediment discharge to predict the loads from un-sampled storms. The sediment transport curve is updated annually as new data points become available. The

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

County is in the process of revising their sediment transport model since they believe sediment yield is being reduced by the continued and rapid urbanization of the watershed.

Comment #24

Sediment and organochlorine loading to Newport Bay is dependent upon an accurate representation of organochlorine concentrations on sediments (C_s) and the sediment loading (D_s) as is used in equation (12). The organochlorine concentrations are taken from Bay et al. (2004) according to the Amended Plan, but there is no indication of how many measurements were utilized to arrive at this value. Given the variability of sediment concentration with flow rate and the variability of organochlorine concentration with sediment levels (Figure 5-3), there must be considerable uncertainty in this estimate of existing load. The sediment loading on an annual basis is estimated in Table 4-8, but there may be a discrepancy with the July 1998 US Army Corps of Engineers Feasibility Report. Table 4-8 reports an annual sediment deposition of 31474.17 m³/y for Unit I Basin but in the 1998 USACE report the computed sediment load for the 22 years of record was 354,000 cubic yards for the same Unit I Basin, and this becomes an average annual loading of 12,000 m³, which is considerably different from the value found in Table 4-8.

Response #24

The location and number of measurements taken from Bay et al. (2004) that were used to calculate existing loads for Upper and Lower Newport Bay are given in the first table in Appendix A-2 in the staff report. The data from the SCCWRP study by Bay and others (2004) were used in these calculations because the study was more spatially representative of the bay than other studies, and the sample locations correlated fairly well with the nodes used in the RMA sediment transport model for the bay.

It appears that the commenter is referring to Table 3 of the July 1998 ACOE report, where the computed net deposition in the Unit I Basin is listed as 354,000 cubic yards and compared to the observed net deposition of 414,000 cubic yards. As indicated in the report text, this is cumulative over the 12-year period from the fall of 1985 through the spring of 1997. The computed net deposition to Unit I during this period is thus 29,500 cubic yards/year (22,554 m³), and the observed net deposition is 34,500 cubic yards/year (26,377 m³). These data were presented to illustrate calibration of the RMA model. The actual model simulations were run using a longer 25-year sediment loading series, and the net deposition estimated in Table 4-8 is from these runs.

Comment #25

On page 65 of the Amended Plan there is the statement that the average annual sediment load was over 100,000 tons per year and the allowable sediment load for Newport Bay is 62,500 tons. There is no discussion of the uncertainty in either of these numbers and they are each likely to be large. The margin of safety of 10% adopted for TMDLs by the USEPA appears to be low. This TMDL process should reflect the uncertainty in the models and resulting estimates should have some range of values specified to clarify the uncertainty.

Response #25

The following table presents summary statistics on hydrologic and sediment data for the San Diego Creek Watershed.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

San Diego Creek Watershed Data	Annual Summary Statistics					
	Min	Max	Mean	Median	Std	CV
Tustin-Ranch Rainfall (in.)	4.22	34.7	13.6	11.2	7.2	0.53
Discharge (acre-feet)	10,610	92,345	33,441	27,154	20,981	0.63
Sediment load (tons)	5,640	618,006	121,538	43,599	169,068	1.39

The rainfall data in the above table is for the years 1962-2006, while the flow and load data for San Diego Creek covers the period 1983-2006. The ten-year annual average sediment load for San Diego Creek is currently 116,248 tons.

As indicated by the coefficient of variation (CV), the annual sediment load has a much greater variability than the annual rainfall, or flow volume. This may reflect the variability in the storms that result in erosive flows, as well as physical changes in the watershed associated with urbanization. The annual sediment load is determined by the County by summing loads from sampled storms and using a regression equation (sediment transport curve) between mean daily flow and mean sediment discharge to predict the loads from unsampled storms. The coefficient of determination (R^2) for the curve is typically around 0.9. The sediment transport curve is updated annually as new data points become available.

To account for the variability and uncertainty in the TMDLs, in addition to the 10% margin of safety, the TMDLs were also developed using a conservative approach, as discussed in more detail on page 77 of the November 17, 2006 staff report. The load estimates are based on the best and most recent data available. However, due to the large number of assumptions that went into these calculations, and the large differences in load estimates that could result from minor changes in some of these assumptions, such as the use of different K_{ows} , or BCFs (see Response #20), or different sediment transport curves, it is not practical to provide a range of values to clarify the uncertainties associated with these assumptions. Additionally, the load allocations are often incorporated into NPDES permits and a range of values would complicate both establishing effluent limitations and determinations of compliance. These TMDLs are phased and allow for revision and refinement of the loads as new information becomes available. The loading numbers, however, do match fairly well with two other independent sources of data – the actual volume of sediment dredged and the net deposition calculated by the periodic bathymetry surveys. In addition, a beryllium isotope study by SCCWRP was consistent with the load data. Therefore it seems reasonable to use a 10% margin of uncertainty.

Comment #26

Hydrologic variability is recognized on page 79, but Figures 7-1 through 7-3 are not reflected in the TMDL analysis. Given the high variability in flow, the high variability in sediment loading, the high variability in organochlorine loading, and the seasonal variability in fish tissue concentrations, the overall analysis does not recognize this or carry along an uncertainty in the estimates. Significant data uncertainties are mentioned on page 81, and there are many ongoing projects that will assist in some of these efforts as summarized in Section 8.2 (page 82), but the level of detail in the summary is not sufficient to indicate if the details of hydrologic variability will be fully represented.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Response #26

The variability inherent in this type of analysis is implicitly recognized in the OCs TMDLs. To account for the variability and uncertainty in the TMDLs, in addition to the 10% margin of safety, the TMDLs were developed using a conservative approach. As discussed in more detail on page 77 of the November 17, 2006 OCs TMDLs technical report, the loading capacities are linked to the sediment TMDL target values, which are long-term (10-year) annual averages that should reflect both maximum and minimum sediment loads to the Bay. The sediment transport model developed by RMA that was used in the TMDLs load calculations may now actually overestimate the amount of sediment being discharged to the Bay as the watershed has become increasingly urbanized since the data used in the regression model were collected (sediment transport data from 1985-1997). On page 79 of the staff report, it is also recommended that because of the pronounced seasonal relationship between sediment discharges and rainfall, and because of the long-term nature of adverse OCs effects, that compliance with the proposed TMDLs be measured over a relatively long time period and evaluated based on the average annual loadings, rather than on a daily basis. (TMDLs expressed as daily averages are proposed, in addition to those based on annual averages, in response to legal requirements.)

At this time, there is no way to directly measure loads and plot them against hydrologic variability during high flow events in the creeks. The County of Orange is currently conducting a study to evaluate legacy organochlorine pesticides and PCBs mass loadings with respect to geographic location, flow, sediment particle size, and total organic content within the San Diego Creek/Newport Bay watersheds. The information gathered by the study will assist with the quantification of existing loads and identification of active sources and appropriate BMPs (see page 83 of the November 17, 2006 OCs TMDLs technical report). Implementation tasks 8.3.4 and 8.3.8 in the staff report (pages 91 and 95, respectively) also include tasks that should result in further refinement to estimates of mass loadings of the organochlorine compounds. For example, one task requires that the temporal and spatial trends of organochlorine compounds concentrations in water, sediment and tissue be assessed so that the variability and uncertainty associated with these parameters can be better defined.

Given the extremely small loads that have been estimated for these compounds (grams per year), the difficulty in direct measurement of these loads, especially under high flow conditions, and the long time frame between cause and effect in biota, it is likely that modeling of sediment transport in the creek will be needed to provide a better estimate of the organochlorine concentrations associated with the sediments in the creeks in the inland areas of the watershed. For Newport Bay, the RMA model will be revised and updated to include newer data (including the changed bathymetry in the bay that will result from the dredging operations that have or are taking place in Upper and Lower Newport Bay) and will be run for fine particulates under varying flow conditions to provide better modeling of sediment distribution patterns that are most likely associated with organochlorine compounds (see page 84 of the November 17, 2006 OCs TMDLs technical report). The proposed TMDL implementation plan also recommends that a special study be conducted to estimate the relative contributions of contaminants from the inland areas of the watershed to those associated with sediments in the Bay that are being potentially re-suspended and re-circulated during tidal fluctuations or storms.

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

Comment #27

As the watershed transitions from range land to agriculture to a mix of commercial, residential and open space, there will be a corresponding change in water quality impacts on the environment. While organochlorine compounds are no longer used or released to the environment, there are many other products available to consumers and landscape professionals that are applied intentionally or non-intentionally on the land surface in commercial and residential areas that may be impacting receiving waters. It would be helpful if the monitoring programs put in place for implementing this Plan Amendment included some anticipatory monitoring. For example I would expect that sediment loads temporarily increase during the transition to commercial and residential land use, and decline following the establishment of more mature vegetated surfaces. Additional loading from crankcase oil, pesticides, fertilizers, animal wastes, and trash might be anticipated and perhaps prevented through a more holistic look at water quality non-degradation rather than waiting for contaminants to emerge with observable environmental impacts.

Response #27

Staff agrees with the commenter that the changes in land use in the watershed that have, are, or will occur, will also result in water quality impacts on the environment. The conversion of land use in the watershed is acknowledged in the OCs TMDLs. Because much of the land that is currently being converted to urban uses was once agricultural lands that may contain soils that still have concentrations of organochlorine pesticides, the implementation plan includes a task (described in section 8.3.4 of the November 17, 2006 OCs TMDLs technical report) to require that construction sites measure organochlorine concentrations in both storm water and non-storm water discharges (see page 92 of the staff report). In addition, revisions to the TMDL include more emphasis to developing a comprehensive holistic Work Plan (see task 8.3.7 in the technical report and Response #17) that will address both current and emerging contaminants and will compliment and enhance monitoring conducted under the Municipal Separate Storm Sewer System (MS4) permit, the Nutrient Regional Monitoring Program (RMP), and the Sediment and Fecal Coliform TMDLs. Regional Board staff has also initiated a tissue and trend monitoring program for the watershed that includes the collection of sediment, fish tissue and water column samples and the deployment and collection of mussels for bioaccumulation. The samples are being analyzed for the current TMDL constituents (selenium, metals, organochlorine compounds) as well as PBDEs and pyrethroids. The sampling and analyses are being performed by the California Department of Fish and Game (DFG) and are following the methods established for the Toxic Substances Monitoring Program (TSMP) and State Mussel Watch Program (SMW) under the Surface Water Ambient Monitoring Program (SWAMP) protocols.

Comment #28

The Amended Plan could be improved if there was more attention to including only significant digits in numerical values. For example in item #5 above, it was reported that sediment load was 31474.17 m³/y when it would have been just as accurate to write 32,000 m³/yr.

***Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs***

Response #28

Comment noted.

Comment #29

On page 51, there is concern expressed that groundwater might be a significant pathway for organochlorine transport based on a January 2006 monitoring report. It is highly unlikely that groundwater will be a significant transport pathway for highly hydrophobic organochlorine compounds, and Table 4.4 indicates there were no organochlorine compound detections. In an era of limited financial resources, it is important to devote those resources to important issues and not get side-tracked with other matters of lesser importance.

Response #29

Comment noted. The statement in the staff report was predicated on the analytical results received for groundwater samples that were collected from monitoring wells in a shallow aquifer that showed detections of DDT. Subsequent monitoring also showed similar concentrations of DDTs in groundwater samples and DDT has also been found in groundwater samples collected in the Calleguas Creek watershed in the Los Angeles region. Regional Board staff will be asking the analytical laboratory to determine whether or not the reported detections are real or the result of analytical error or cross-contamination. The shallow aquifer that underlies portions of the San Diego Creek watershed provides around 85% of the perennial flows in San Diego Creek and its tributaries. If organochlorine compounds are pervasive in this aquifer, even though they may be at very low concentrations, the high volume of groundwater present as base flows in the creek that enter the Bay may in fact prove to be a significant long-term source of these contaminants. However, the primary focus of future studies and BMP implementation is on further reducing organochlorine compounds associated with sediment loads, not groundwater, and it is likely that these detections in groundwater are either an artifact from the analytical laboratory or sampling equipment or are limited in extent.

Comment #30

Arriving at appropriate TMDLs for complex watersheds is a challenge that can be met through exhaustive data analysis, modeling, and measurements as has been undertaken for the San Diego Creek/Newport Bay. The Amended Plan has made a good start at developing the necessary modeling approaches and data analysis for predicting future conditions and anticipating actions required to meet water quality objects. The appropriate combination of modeling, monitoring, and analysis is a logical means of protecting the water quality for the future.

Response #30

Comment noted. The phased nature of these TMDLs allows us to move forward with an implementation plan that includes measures to reduce sediment loads, and thereby reduce organochlorine compounds loads, provides a reasonable compliance timeframe that will allow refinement/revision of numeric targets and loads as additional data are collected and analyzed, and will institute additional monitoring that will compliment current monitoring efforts and will help to determine the effectiveness of implementation actions so that beneficial uses in the watershed are protected.

**Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs**

Dr. Erik R. Christensen, University of Wisconsin, Milwaukee
Via e-mail review letter dated May 2, 2007, revised May 4, 2007

Comment #31

Note that Food and Drug Administration (FDA) criteria are less stringent than OEHHA criteria for fish tissue concentrations of total PCBs (Table 2, Appendix B, Rose 2006). For example, FDA's limit for PCBs is 2000 ppb compared with OEHHA's more stringent limit of 20 ppb. Sediment quality guidelines are given in Table 3 of Appendix B (Rose 2006). Sediment toxicity data are more scattered, but contaminated sediments do show some effect, for example for chlordane in Upper Newport Bay where 27/36 samples exceeded the NOAA ERM of 6 µg/kg dw (Appendix B, Rose 2006. Note: page numbers should have been included in the appendices). Water quality criteria exist (Table 1, Appendix B, Rose 2006) but most measurements show nondetectable concentrations with the methodologies used.

Response #31

Comment noted. OEHHA fish tissue screening values for human consumers of fish were used in the impairment assessment and as numeric targets for fish tissue concentrations. FDA Action Levels are only provided in the report for comparison purposes. Staff will be looking at sampling and analytical methods that will provide better detection limits for organochlorine compounds in water, sediment, and fish tissue. The implementation plan recommends that additional studies of the linkage between toxaphene concentrations in sediment and fish tissue be pursued, as there is a large degree of analytical uncertainty with measurements of toxaphene in environmental samples that use standard methods.

Comment #32

Fish and to a lesser extent sediment concentrations indicate that there is a valid concern for water quality with respect to organochlorine compounds in San Diego Creek and Newport Bay. This is despite the fact that concentrations are declining because of the ban on these compounds.

Response #32

Comment noted. This is why TMDLs are being developed for organochlorine compounds in San Diego Creek and Newport Bay.

Comment #33

The numeric targets for organochlorine compounds for the water bodies are given in Table 6-1a (USEPA 2002) and Table 3.1 (Rose 2006). They are in general agreement except for total PCBs in fish tissue of Newport Bay (30 vs. 20 ppb). The values seem to be reasonably well established except that further rationale should be given for human health vs aquatic life target values (Rose 2006). PCBs should be analyzed by congener and not aroclor since congeners can be very different in their toxicity. Co-planar congeners or dioxin-like PCBs are generally considered to be more toxic.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Response #33

The total PCBs fish tissue concentration listed in Table 6-1a in the 2002 USEPA TMDLs is incorrect. The correct OEHHA fish tissue screening value for PCBs is 20 ppb (wet weight) as shown in Table 3.1 of the November 17, 2006 OCs TMDLs technical report (Rose 2006). PCBs have been analyzed by congeners for all monitoring and studies conducted since at least 2000. The Southern California Coastal Water Research Project (SCCWRP) is currently conducting a study that is assessing the transfer of organochlorine compounds and trace metals in the fish food web in Newport Bay. California halibut, a high trophic level species in the Bay, are being collected in addition to a variety of fish species from lower trophic levels. All samples, including fish food items, will be analyzed for PCB congeners. For comparison to predator-risk guidelines for PCBs, PCB congener concentrations will be converted to Toxicity Equivalent Quotients (relative to dioxin TCDD). The relative toxicity of PCB congeners will be calculated separately for bird and mammal predators of the fish species sampled.

Comment #34

The calculations of sediment targets through eq. 3, p. 38 (Rose 2006) is reasonable. A better rationale for using NAS guidelines for fish tissue targets is needed. It is not clear how fish tissue targets were calculated. The calculation of targets for human health protection through the 70 yr, 70 kg body weight calculation may be ok provided that consideration is given to declining input concentrations and that dose-response factors need to be well determined (p. 38, Rose 2006).

Response #34

The NAS guidelines and OEHHA screening levels that were used for numeric fish tissue targets for the protection of wildlife and human consumers of fish are specifically recommended by the 2004 Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) for use in impairment assessments. The freshwater NAS guideline for DDT is applied to both aquatic plants and animals on an individual basis and is less specific in its intent than the marine guideline. The marine NAS guideline for DDT is specific to the piscivorous food web; the guidelines are based on composites of fish in the size range consumed by the birds or mammals of concern. Given the fact that many species of birds, including the endangered California Least Tern, forage in freshwater, estuarine, and marine environments, the more conservative of the two NAS guidelines would have to be met at all these locations to ensure protection of those species. As we do not have access to all of the data that the different NAS panels used, we cannot judge why different values for freshwater and marine aquatic life were obtained.

The human health fish tissue targets are based on the 1999 OEHHA fish tissue screening values, which were calculated based on a 10^{-5} cancer risk. While both the NAS- and OEHHA-based numeric fish tissue targets do not take into account the declining concentrations of these contaminants, their attainment is expected to result in the restoration and protection of the beneficial uses in the watershed. The proposed TMDL implementation plan recognizes that concentrations of these contaminants are declining and incorporates tasks that are designed to enhance or supplement this natural attenuation. The implementation plan also allows for the refinement/revision of the TMDL numeric targets as more data become available.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Comment #35

Some consideration needs to be given to mixture effects in the biological response to many pollutants. For similar compounds toxic units tend to add up, but for different modes of action, there are many possibilities. Generally, mixture effects would lower permissible concentrations and TMDLs. Some further discussion of this issue could be included p. 77, Rose (2006).

Response #35

Threshold Effect Levels (TELs) are used as numeric sediment targets in the TMDLs. TELs represent the concentrations below which adverse effects from toxic constituents are expected to occur only rarely. TELs are considered to provide useful tools for identifying sediment quality conditions that are likely to be supportive of healthy, self-sustaining populations of benthic invertebrates in urban embayments that frequently have complex mixtures of various chemicals in the sediments (Dr. Donald D. MacDonald, MESL, comment letter dated February 20, 2007; Appendix E).

The effects of multiple contaminants on biota are poorly understood; while some contaminants may have synergistic effects on organisms, others may result in antagonistic effects. The speciation, isomer, or congener of a contaminant may also react differently with other contaminants than the “parent” compound or sum total of the particular class of contaminants (i.e., coplanar PCBs are more toxic than non-coplanar ones and may interact differently with other chlorinated compounds or metals; also selenium and arsenic may act antagonistically, but the species of As and Se and their relative concentrations determines whether or not they counteract each other). For the organochlorine compounds, concerns have been raised that PCBs and organochlorine pesticides may act synergistically on organisms as they have similar adverse effects on reproduction and infant development (Schwacke et al., 2002). TMDLs, however, generally focus on single-contaminant effects as it is not practical, and the methodologies are not readily available, to try to estimate the effects of mixtures of these contaminants on the biological system. Interactive effects are generally accounted for by incorporating conservative assumptions into the impairment assessments and numeric targets.

Comment #36

One recommendation is that source identification should rely not only on enumeration or quantification of known sources but also on receptor modeling. For example chemical mass balance (CMB) and factor analysis using for example positive matrix factorization (PMF) based on pollutant or congener profiles can identify sources and their contributions.

Response #36

Since DDT and PCBs present in the Newport Bay watershed are legacy chemicals that result from a variety of uses and applications (i.e., DDT was applied to row crops and used for termite control in urban structures; PCBs were used at military bases and in transformers and paints in shipyards and urban areas) and not from manufacturing facilities present in the watershed, the use of CMB and PMF to determine their original mixture origins (e.g., using PMF to determine source profiles of PCBs to estimate their original Aroclor mixtures) has not been considered. Several studies are being conducted to

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

determine the locations of soils or sediments in upland areas or within Newport Bay that may still, or could potentially, contribute to pollutant concentrations and loadings in the watershed. The Bay Protection Toxic Cleanup Program (BPTCP) and Consolidated Toxic Hot Spots Cleanup Plan (SWRCB, 1999) have identified several contaminant hot spots in California's enclosed bays, estuaries, and coastal areas. The Rhine Channel, located in lower Newport Bay, has been designated a high priority toxic hot spot, and efforts are currently underway to implement remediation of the contaminated sediments in the channel. Sediments in the channel are contaminated with PCBs, organochlorine pesticides and heavy metals. The highest concentrations of PCBs in bay sediments have been consistently measured in the Rhine Channel.

The implementation plan in the November 17, 2006 OCs TMDLs technical report outlines several special studies that are currently underway in the Newport Bay watershed that should help to better define the sources of organochlorine compounds in the watershed (see section 8.2 of the November 17, 2006 OCs TMDLs technical report). SCCWRP has just completed a study to investigate storm water particulates and bedded sediments in Upper Newport Bay (UNB) from a variety of land uses in the watershed using gas chromatography-mass spectrometry (GC-MS), compound specific isotope ratio analysis (CSIA), and chiral gas chromatography (CGC) (Peng et al., 2007; SCCWRP Technical Report 512). Preliminary results of the study indicate that concentrations of trace organic contaminants in storm water particles were greater than, or equal to, the concentrations of trace organic contaminants measured in the UNB bedded sediments and that some trace organic constituents were associated with some land uses more than others (e.g., average storm water particulate concentrations of total DDT at agricultural land use sites was an order of magnitude greater than any other land use examined). The County of Orange is evaluating legacy organochlorine pesticide and PCBs mass loadings in the watershed with respect to geographic location, flow, sediment particle size, and total organic content. SCCWRP is also investigating the transfer of organochlorine compounds within food webs in Newport Bay and identifying trophic pathways of importance to humans and wildlife. This study will also attempt to identify locations in Newport Bay where elevated concentrations of organochlorine pesticides and PCBs in fish tissue and sediment have been observed and correlated so that these areas can be prioritized for remediation.

Comment #37

The linkage analysis is fairly well described in USEPA (2002) compared to Rose (2006). The diagrams p. F-1 and F-2 are clear although there should be a division sign between fish tissue and BCF in Fig. F-1, and Fig. F-2 reflects an oversimplification of the problem.

Response #37

Comment noted.

Comment #38

The case of Newport Bay and to some extent San Diego Creek illustrates the difficulty in using the loading concept in that sediments have a different role in releasing pollutants to the water column depending on sedimentation rate and sediment mixing. Significant mixing in upper sediment layers can release more pollutants to the water column. The role of sedimentation rates and sediment mixing in making pollutants available to the ecosystem

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

should be clarified by models and observations. Volatilization could also be considered. This issue should be addressed.

Response #38

Section 8.3.9 in the November 17, 2006 TMDLs technical report (page 96) identifies several special studies that have been recommended by the Technical Advisory Committee (TAC) for these TMDLs and/or Regional Board staff that can be used to refine or revise the OCs TMDLs. Study number 5 recognizes that the relative importance of continuing organochlorine compounds discharges to receiving waters through erosion and sedimentation in the upland areas of the watershed needs to be evaluated and compared to the recirculation of existing contaminated bed sediments in the bay. Sediment mixing and sedimentation rates would be essential to this type of study. As discussed in the discussion of the implementation plan (page 84, Section 8.2 of the November 17, 2006 OCs TMDLs technical report), the sediment transport model for Newport Bay is being updated and refined to: (1) predict general sediment deposition rates in the bay under current loading conditions; (2) incorporate revised bathymetry, storm hydrographs, and sediment-flow regression equations; and (3) to predict fine-textured sediment deposition rates and patterns in the Bay to help identify areas of continuing contaminant deposition/recirculation.

Comment #39

The pollutant inventory in the Newport Bay sediments should be estimated and compared with annual TMDLs, for example 160 g/yr of DDT input to Upper Newport Bay. I suspect that this and other TMDLs are small compared with the pollutant inventories in the sediments. Thus, even with zero input to the Bay there can be a significant recycling of DDT from bottom sediments which means that it can take a long time before DDT can be delisted. Note, however, that DDT concentrations do decline over the years (Fig. 2-3, Rose 2006). This decline is likely to be influenced both by lower inventories and lower inputs.

Response #39

Comment noted. Monitoring and special studies that will be conducted during implementation of these TMDLs will be designed to address this issue. (Please also see Response #38.)

Comment #40

Values of TMDLs are listed in Tables 6-5 – 6-8 of USEPA (2002). Similar values of TMDLs proposed by SARWQCB are listed in Table 6-1a (Rose 2006). Load allocations by source type, similar to those in the EPA report are shown in Table 6-2b. The numbers are fairly similar, mostly within a factor 2, for corresponding pollutants, source categories, and water bodies. One significant deviation is for example for chlordane, in Upper Newport Bay from urban runoff. EPA shows 120.5 g/yr and SARWQCB 30.1 g/yr. Another example is total PCBs in Lower Newport Bay which is 409.8 g/yr by EPA and 241 g/yr by SARWQCB. Some further work should be done to seek to clarify or justify these numbers. Clearly, there is significant uncertainty in this evaluation. TMDLs for PCBs and chlordane in San Diego Creek may in fact not be required.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Response #40

The reasons for the discrepancy between EPA loads for chlordane and PCBs and Regional Board staff's calculated loads are that (1) EPA used chlordane concentrations as reported in a draft SCCWRP report; subsequently, Regional Board staff found errors in the chlordane data and these were corrected in the final report (Bay et al., 2004) and in Regional Board staff's load calculations; and (2) the lower calculated load for PCBs resulted from the large number of non-detections (NDs) in the data base; in the calculations, Regional Board staff used half the method detection limit to represent these NDs.

The proposed TMDLs for PCBs and chlordane in San Diego Creek are informational only. The impairment assessment conducted by Regional Board staff did not establish impairment due to chlordane or PCBs for San Diego Creek or any of its tributaries (please see page 28, Section 2.4.4 in the November 17, 2006 OCs TMDLs technical report). The informational TMDLs are recommended because for chlordane, data suggest that the existing load of chlordane to San Diego Creek may be greater than the loading capacity. Further, San Diego Creek is the largest source of organochlorine compounds to Newport Bay, which was found to be impaired for both PCBs and chlordane. The lack of a finding of impairment for chlordane (and PCBs) for San Diego Creek may simply reflect a lack of data with which to assess impairment.

The Clean Water Act provides the legal basis for developing TMDLs, for informational purposes, in situations where impairment has not been established. CWA §303(d)(3) states

"For the specific purpose of developing information, each State shall identify all waters within its boundaries which it has not identified under paragraph (1)(A) and (1)(B) of this subsection and estimate for such waters the total maximum daily load with seasonal variations and margins of safety, for those pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation and for thermal discharges, at a level that would assure protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife."

While such informational TMDLs would have no regulatory effect and would not be implemented at this time, if impairment is established for chlordane and PCBs in San Diego Creek in the future, they would facilitate development of a Basin Plan amendment.

Comment #41

The margin of safety is taken as 10% of the total TMDL. This seems to be reasonable. The area has a strong seasonality as evidenced by the annual rainfall pattern, Fig. 7-1 (Rose 2006). Thus much of the sediment input to the estuary comes during episodic events with a few heavy rainfalls. The implication for BMPs and WDRs is that they must be geared towards an accurate description of these events.

Attachment C3 - Response to Peer Review Comments
San Diego Creek/Newport Bay Organochlorine Compounds TMDLs

Response #41

Comment noted. The proposed implementation plan recognizes this and is requiring evaluation and revision of existing WDRs and NPDES permits, construction sampling plans and BMPs, and the development and implementation of an agricultural monitoring and BMP program in the watershed (for a description of these tasks, see Section 8.3, Phase I Implementation, in the November 17, 2006 OCs TMDLs technical report).

Comment #42

The implementation plan indicated in Tables NB-OCs-13 and 14 makes sense. The phased approach is reasonable. One should be prepared for an adaptive strategy depending on climate. A certain amount of dredging may be necessary in the most contaminated areas. The use of polyacrylamide (PAM) in stabilizing graded areas (p. 107, Rose 2006) and enhancing flocculation should probably be limited as the introduction of chemicals in the environment should be avoided if possible.

Response #42

Comment noted. The proposed implementation plan includes a task to evaluate the feasibility and to investigate mechanisms for ensuring funding for future dredging operations in the watershed (for a description of this task, see page 93, Section 8.3.6 of the November 17, 2006 OCs TMDLs technical report).

Comment #43

As the phased process of TMDL implementation continues, the Santa Ana Regional Water Quality Board should pay attention to the advice from the public following the June 2005 CEQA scoping meeting listed on p. 114 in Rose (2006). Some of the points raised were that future meetings should be properly noticed, that there should be appropriate coordination with other California agencies such as the Department of Fish and Game, and that some facts are encouraging despite the OC contamination, for example that the population of endangered bird species such as the clapper rail population has doubled in a relatively short period.

Response #43

Comment noted. Public participation is and has been an important part of the TMDL/Basin Plan amendment process and any errors in noticing are inadvertent and rare. The need for consultation with other resources agencies, including the Department of Fish and Game, is well recognized and is an important part of consideration of these and other TMDLs/Basin Plan amendments. Encouraging information is welcomed and hopefully will be reflected in future TMDL decisions, including possible delisting of one or more of the organochlorine compounds from the 303(d) list of impaired waters.

Regional Board staff has developed a Substitute Environmental Document (SED) to address the CEQA issues that have been raised by the public and as required under the Arcadia decision (*City of Arcadia v. State Water Resources Control Board* (2006) 135 Cal.App.4th 1392). The SED will be re-circulated for additional public comments 45 days prior to the adoption hearing for the organochlorine compounds TMDLs.